

Fiber Optic Shape Sensing for Tethered Marsupial Rovers, Phase I

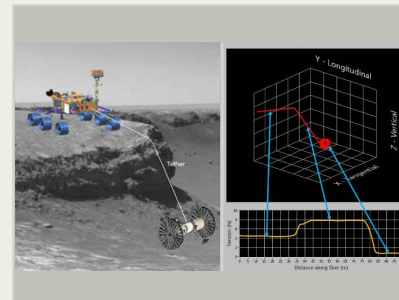
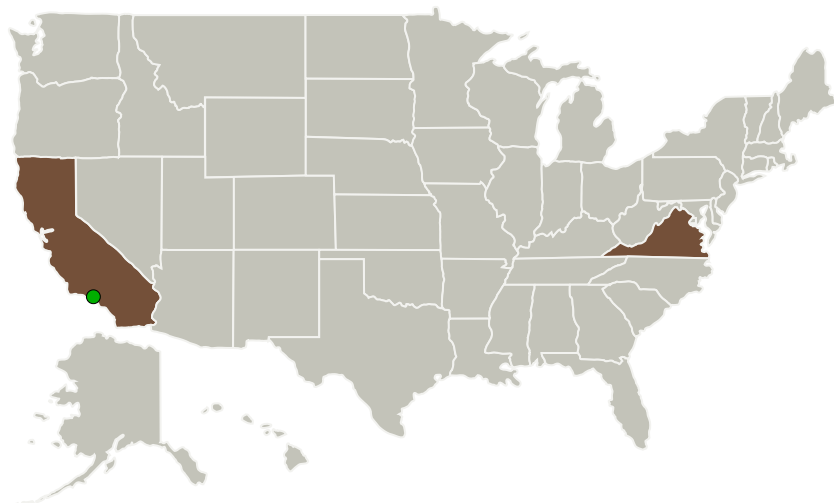
Completed Technology Project (2013 - 2013)



Project Introduction

Luna Innovations Incorporated is proposing to design, build, and test a shape, length, and tension sensing tether for robotic exploration and sample-gathering missions on remote planets and moons. The proposed tether system is capable of determining the location and orientation of marsupial robots as they navigate difficult terrain. The tether system will also provide shape and tension information along the entire tether, distinguishing elevation changes, tension due to snags, and potential points of harm. The tension feedback is particularly crucial, as it can be used to determine whether the rover has fallen down a slope or cliff, lost traction, or whether it is still moving under its own power. The system is based on Luna's unique fiber optic position and shape sensing technology, and is an enabling technology for obtaining images, data, and samples in areas with difficult terrain. In addition to providing new, vital feedback, the fiber optic shape sensor within the tether is lightweight, small, and flexible. Luna's unique shape sensing fiber also has the potential to provide both communication and power through the same fiber, further reducing the size and weight of the total tether package.

Primary U.S. Work Locations and Key Partners



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Organizations Performing Work	Role	Type	Location
Luna Innovations, Inc.	Lead Organization	Industry	Roanoke, Virginia
● Jet Propulsion Laboratory(JPL)	Supporting Organization	NASA Center	Pasadena, California

Primary U.S. Work Locations

California	Virginia
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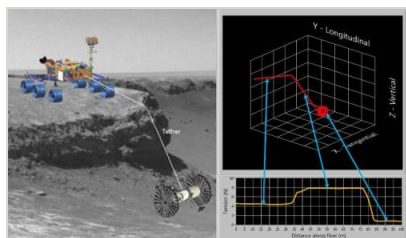
Project Transitions

**May 2013:** Project Start**November 2013:** Closed out

Closeout Documentation:

- Final Summary Chart(<https://techport.nasa.gov/file/140461>)

Images



Project Image

Fiber Optic Shape Sensing for Tethered Marsupial Rovers
(<https://techport.nasa.gov/image/126765>)

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Luna Innovations, Inc.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Principal Investigator:

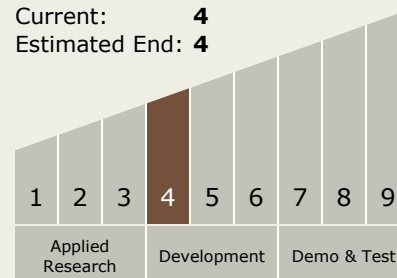
Emily Horrell

Technology Maturity (TRL)

Start: 4

Current: 4

Estimated End: 4



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Technology Areas

Primary:

- TX04 Robotic Systems
 - └ TX04.1 Sensing and Perception
 - └ TX04.1.1 Sensing for Robotic systems

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System